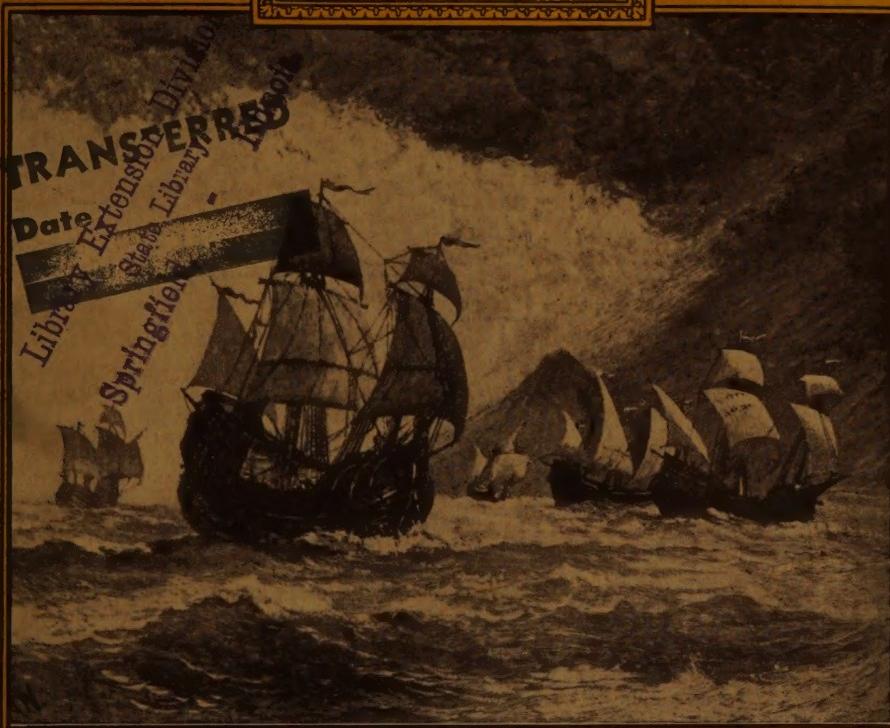


THE MENTOR

July 1922



Magellan's Fleet—The First Ships That Girdled the Globe

GIRDLING THE GLOBE

By William J. Henderson

The Ocean Cables

Sailing the World Alone

Questionnaire Prize Winners in This Number

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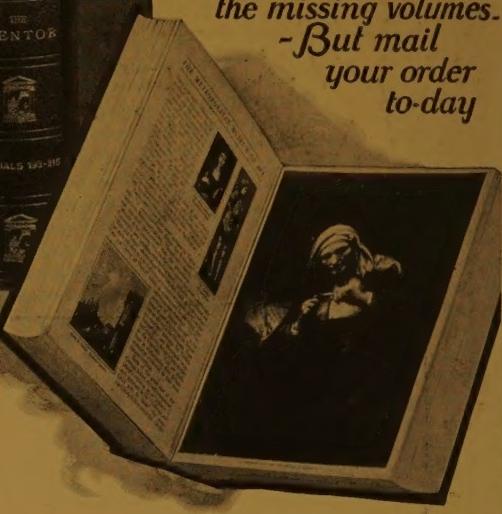
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A silver statue exhibited at the Columbian Exposition, Chicago, 1893

Columbus the Navigator

THE MENTOR

VOL. 10

JULY 1922

No. 6

GIRDLING THE GLOBE

The Story of Navigation

By W. J. HENDERSON

Author of "Elements of Navigation," "Last Cruise of the Mohawk,"
"Sea Yarns for Boys," etc.

LEIF, the son of Eric, hardy Norseman with a heart of fire, sailed out in the year 1000, with thirty-five companions, into the tempestuous, mystic, terror-haunted North Atlantic, driving his oaken prow toward the unknown western land of which his countryman Bjarni Herjulfson had boastfully written. Leif's ship was of wood, no more than a hundred feet long, and in her midst stood one mast, from which swung upon a yard a single sail. Leif knew the North Star, and that was his guide by night, if clouds did not hide it. Perhaps he had some sort of rude compass; no one knows, but it is more likely that he did not. All he knew was that if he kept going westward he would come to a land which old men said some of his people

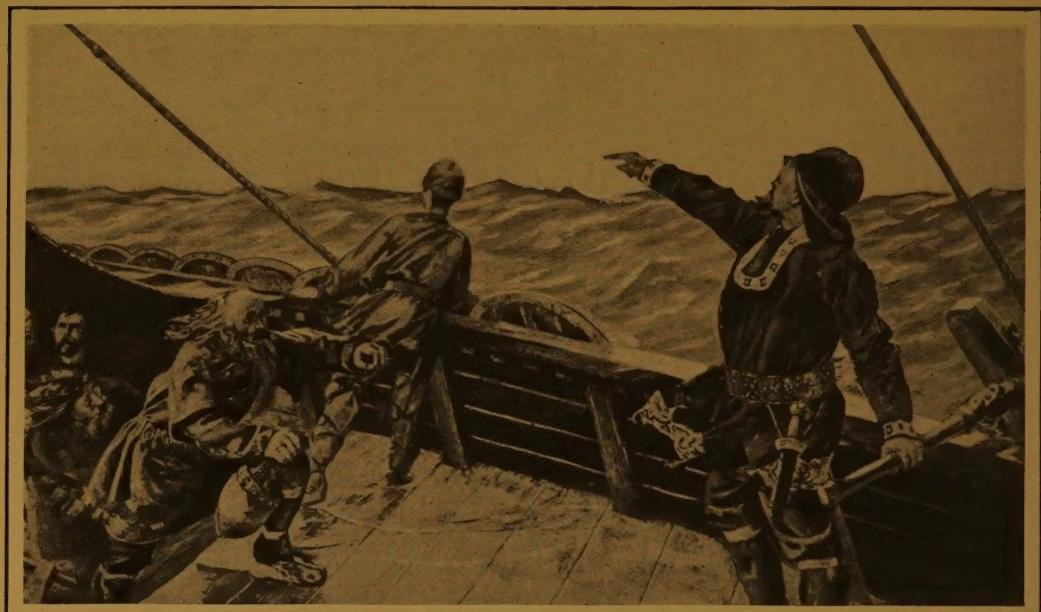
had visited. His ship was no better than those used by the Phoenicians and the Greeks. Indeed, it was not as good, for they had oars to help them when the wind was adverse. He had no chart, he knew almost nothing about latitude, and nothing at all about longitude. He had only his insatiable desire to find out things, and his unquenchable courage. And so Leif's dauntless spirit and his stout little ship carried him to Greenland, and thence down the coast of North America, even as far as Connecticut.

When Nero was planning to drown his mother by sinking a ship with her on board, the Romans (about 60 B. C.) already had three-masted ships like those of Columbus, and spoke jeeringly of the Alexandrians because they used mastsails. The



Ferdinand Magellan
(1480—1521)

A Portuguese, sailing under the Spanish flag, he set out from Spain, September, 1519. His expedition sailed completely round the earth, returning to Spain in September, 1522, a year after Magellan's death in the Philippines.



From a painting by Krohg

Leif Ericson, First White Discoverer of the Western Hemisphere
In the year 1000 he and his companions sighted the coast of the new continent

mariners of Venice, queen of the Adriatic, had no better ships in the twelfth century. The ship in which St. Paul was wrecked carried 276 persons, and was like that of Nero's mother. When the Norsemen began to drive down the coasts of France, it was learned that they had taken to using oars as well as sails. But there was no ship fit to battle with unknown oceans.

Among the islands and shoals of European coasts hundreds of mariners risked their lives, but when they gazed westward upon the shoreless sea their hearts quailed. Leif Ericson knew no fear. He followed the setting sun into the unknown, and the land which he found was lost to the world till, nearly five hundred years later, an Italian, Cristoforo Colombo, embarked from Palos, Spain, to seek the East Indies by sailing around the world westward, and he met the lost continent in his path. In the mag-

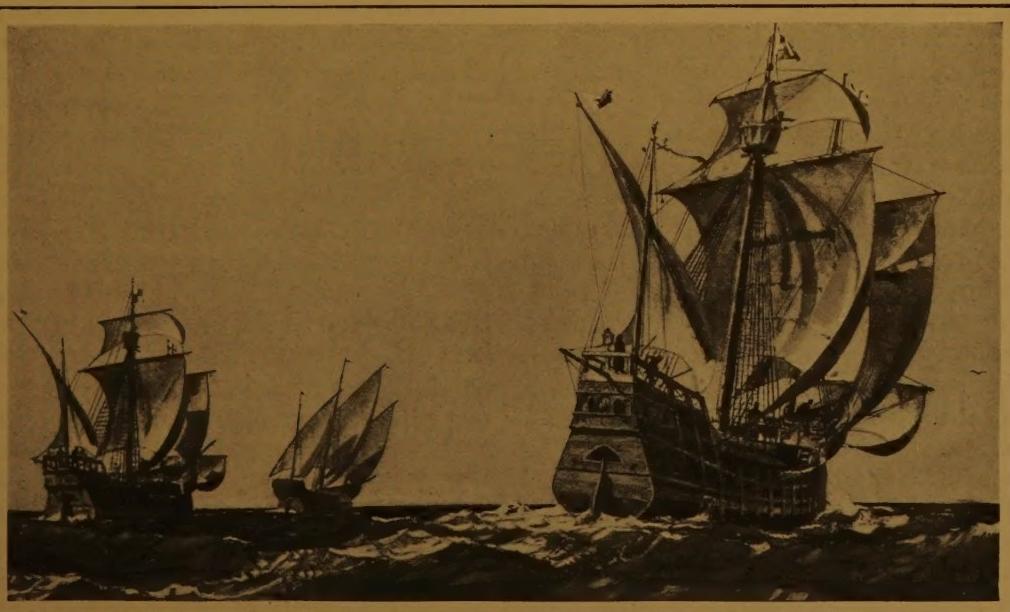
nificent boldness of his undertaking, Columbus rivaled Leif. His ships were no better than those of the Byzantine mariners of the Mediterranean 500 years before his time. The flagship of his fleet of three was a 100-ton vessel. She had three masts, but the foremast was hardly more than a bowsprit and carried a little square sail. The center mast had a square mainsail and a topsail such as the Alexandrian ships had in the time of Nero. She could make eight knots an hour with a fair wind, but in the best conditions could not work to windward over twenty-five miles in a day. A mariner of our time would not have tried to go from Sandy Hook to Cape May in her.

When Columbus wanted to know how fast his ship was going, he threw a piece of wood over the bow and watched it slide along the side to the stern. Then he did a little arithmetic. If the ship passed the chip by her

whole length in one minute, how long would it take her to go a nautical mile? The direction in which she was going he knew, rather vaguely to be sure, by his compass. And there was the North Star on clear nights, the North Star to which the compass did not directly point. Columbus knew about variation of the compass, but it was not till he went across the western ocean that he learned that it was different in different places. When the earlier seamen found that the needle did not point right at the north pole, they did not know it was because the magnetic north pole was some hundreds of miles south of the top end of the earth's axis, called the geographical north pole, but they did take note of the amount of error, and set their needles on their compass cards to allow for it. They made the allowance for the coast, from which they never went far. Columbus' men were terrified when they found

that as they went westward the needle's variation changed. They wished to turn back, but Columbus resolutely held on his course, and studied the new phenomenon scientifically. Old as the compass was, little was known about its irregularities. The Chinese were acquainted with the loadstone more than a century before Christ, but they did not know what to do with it. It was not till the Arabs embarked upon the navigation of the Indian Ocean and the Mediterranean that the needle became the guide of the mariner. The Arabs were the first to mount the needle on a pivot; but even they resorted to its use only when the weather was so cloudy that they could not see the sun or the stars.

Of course, astronomy was ages old. About 2500 b. c. the Chinese knew how to measure the altitude above the horizon of the sun or a star when it was crossing the meridian. They



From a painting by Zeno Diemer

The Caravels of Columbus

The *Santa Maria*, the *Pinta*, and the *Nina*, headed for the unknown lands of the West



From the painting by Ernest Board in the Art Gallery at Bristol, England

Sebastian Cabot

Son of John Cabot, and a native of Bristol, makes ready for his memorable voyage to North America

had rude instruments for measuring such altitudes, and they noted the time of their observations by water clocks. The Greeks knew much about astronomy, but they did not find out how to determine latitude at sea from the altitude of a star on the meridian. As for longitude, that remained a mystery to navigators for many centuries. But Columbus had a compass, and it had a card with the north point marked with a *fleur-de-lis* just as we mark it now, and with the other points printed on the circumference, and the needle under the card moving on a pivot. With the compass and the bit of wood floating past the ship's side for his log, he kept his dead reckoning. A mariner makes note every hour of the direction in which his ship goes and how far she moves, and at the end of the day he computes the entire distance traveled and the new latitude and longitude to which he has come. Even in these times of patent recording logs and perfected compasses it is not a wholly certain method. Yet it was pretty nearly all Columbus had, for when it

came to taking observations of the sun or the North Star, he had only a rude instrument for measuring the altitude.

Altitudes are reckoned in degrees and minutes, because every circle is divided into 360 degrees, and altitude measurements are made against the face of the heavens, which is circular. Columbus had a cross staff, the crudest of all instruments for taking altitudes, and about the best he could do was to get a rough estimate of his latitude.

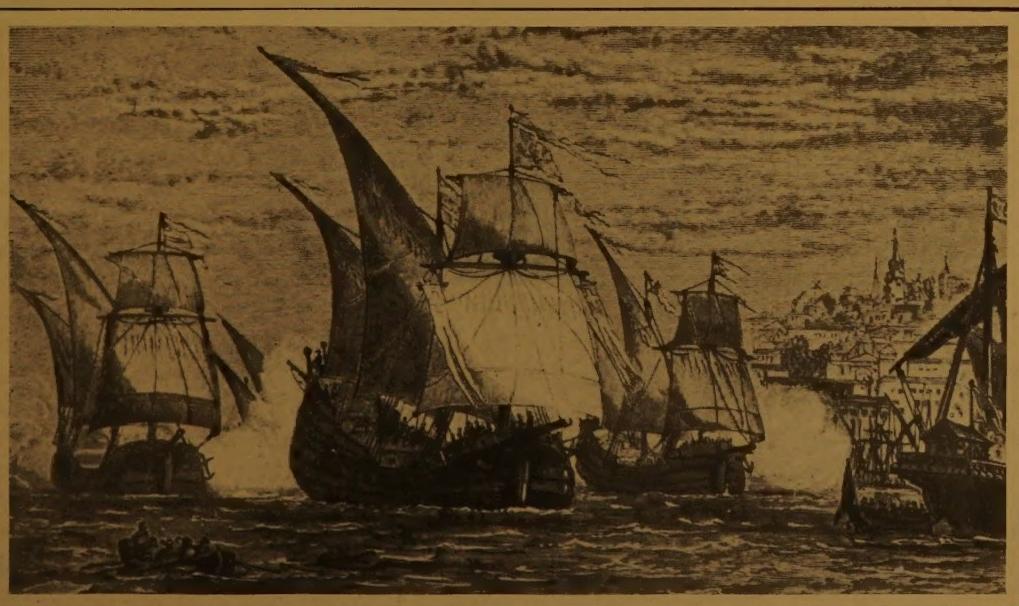
In order to ascertain his latitude a navigator must know the declination (or latitude) of the sun or star whose altitude he takes. From the altitude he deduces his own distance north or south of the sun. This distance, combined with that of the sun north or south of the equator (its declination), gives him his own distance from the equator, and that distance is his latitude.

Columbus had a set of fairly good tables of the sun's declination, because Prince Henry the Navigator (as he is called in history), who died in 1460, had established stations for studying all the astronomical data then known to be necessary to navigation. Another item was the correction for altitude of the North Star. These old-time navigators had learned from the still earlier astronomers that the pole star was not on the pole, but revolved around it, and that in order to find the true pole, and thus one's correct latitude, it was necessary to know just how far away from the pole that revolving star was.

And there we have before us the

equipment with which Columbus drove boldly forward into unknown, uncharted, and perilous seas. A day of stormy weather was enough to drive him he knew not where. Even in these days ships sometimes lose their way temporarily, but we have swift methods of finding both longitude and latitude. Give us a flying sight of the sun between clouds or a bright star at night, and we soon have our position. Columbus must have been always uncertain of his latitude, and he probably never knew his longitude after he was fifty miles from the land. Doubtless he had heard of the method of finding longitude by measuring the angular distance between the moon and a star. It was mentioned by writers in the sixteenth century. But how could the early navigators have utilized it? The true positions of the moon and the stars were not known, and there was no good instrument for taking the required measurement. And to dismiss

this matter at once it may be said that the lunar method was never serviceable, even at its best, for with it one could not get within half a degree of his longitude. The discovery of the West Indian islands by Columbus, who was supposed at the moment to have revealed a new continent, set Europe ablaze with excitement. The world went mad with the lust of discovery and conquest. Crazy ships, inadequate methods of finding one's way, deterred none. To sail west meant to lift a new world above the horizon. It was there somewhere, and one was bound to run into it. Henry VII of England issued a patent to John Cabot, a Venetian merchant living in Bristol, to sail anywhere in search of anything—for that was what the patent really meant—and he embarked with his five ships in May, 1497. There is no record of the terrors of this fearsome voyage. Cabot did manage to go pretty nearly west and, instead of the spice-laden beaches



From an old print

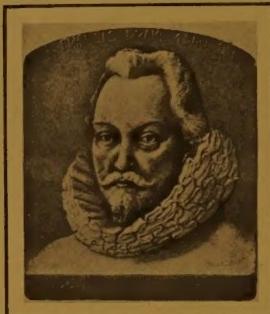
Out of the Picturesque Harbor of Lisbon, Vasco da Gama, in July, 1497, Turned His Prows Toward Far-off India

and sunny climes of Columbus' islands, he found himself among polar bears, icebergs, and thundering surges on the iron coast of Labrador. His son Sebastian Cabot made a later voyage, and when he had reached Labrador he fled southward from its inhospitable shores and coasted as far as our Maryland. And what Sebastian Cabot reported to Henry, King of England, brought England to the new continent. No more than seven years later the dauntless fishermen of Normandy and Brittany were dragging the cod from the Newfoundland banks, Cape Breton was christened, and Denis of Honfleur made a map of the Gulf of St. Lawrence. Man's conquest of the North Atlantic was achieved. Death and suffering still confronted bold mariners, for ships were fragile and methods of navigation primitive, but the mysteries had been dispelled. A continent was recognized, and what remained was to find the priceless short cut around it to the East Indies.

With Columbus went his relative Martin Pinzón as a pilot. We are not astonished to find that in 1498 two others of this amphibious family, Vicente Yáñez Pinzón and Ariéz Pinzón, with four caravels sailed de-

liberately southwest seeking a path around America. They crossed the equator and were presently stopped by the coast of Brazil. They turned northward, and after a time came to the mouth of a vast river which we know as the Amazon. They captured a few savages for slaves, sailed up to the West Indies and back to Spain, and it was not till they reached home that they learned that Pedro Alvarés Cabral, a Portuguese, had reached Brazil in 1500 and taken possession of it in the name of his king. The South Atlantic was conquered and the iron heel of Europe planted on its western coasts.

None knew that still further west beyond the new-found continent there rolled in perpetual unrest another mighty sea, wider and deeper and more appalling than that which had been subjugated. But man's fear of unknown seas was rapidly diminishing. He knew that he was their master. In 1513



Sir Francis Drake
Sea-fighter, rover, and adventurer.



From a print made in Drake's lifetime

The Golden Hind

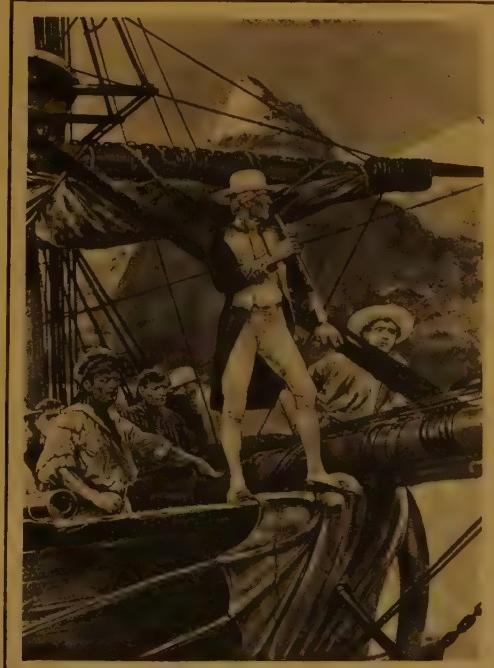
Which carried Drake on his sensational voyage around the world. On its deck he was knighted by Queen Elizabeth

Vasco Nuñez Balboa and Francisco Pizarro crossed the Isthmus of Darien and saw an ocean which they called "Mar de Sur," but they went no further. That hero of poetry and song, the hero of Meyerbeer's opera "L'Africaine," Vasco da Gama, a Portuguese, with four ships was sent by the

king in 1497 to find the way eastward around the southern extremity of Africa, of which reports had been made by other mariners. The Cape of Good Hope, like Cape Horn, is a stormy promontory. There the sailor meets mountainous seas and baffling winds, and a score of terrifying legends fill the waters with direful things. It was the Cape of Good Hope that was haunted by the Flying Dutchman—but he was invented after Vasco's day. The intrepid Portuguese fought the tempests and won. He carried his ships around the cape four months after starting, and in May, 1498, reached Calicut, on the Malabar coast. The boldness and tremendous importance of this discovery places the name of Vasco in the forefront of the conquerors of the seas.

It needed but one thing more to complete the marvelous chain of discoveries that glorified the final years of the fifteenth and first years of the sixteenth centuries. And that last link was supplied by another immortal Portuguese navigator, Ferdinand Magellan, who was sent out in 1519 by Charles V of Spain to find a western route to the East Indies. Magellan's ships were no better than those of Columbus, nor did he have any more accu-

rate methods of finding his way. But bravely he drove his squadron down upon the South American coast, and followed its sinuous line southward in search of a passage. Finally, on October 21st, he came to the entrance of the great strait which bears his name. For thirty-eight days, through howling, biting winds, amid snow-covered mountains, in swift and treacherous currents—one of his vessels deserting him—he forced his way westward over the 360 miles till, on November 28th, the battered flotilla swam out past Cape Desado into the vast and unexplored ocean which Balboa had seen many leagues farther north. Across this gigantic sea gentle winds wafted Magellan for 98 days. He called that sea the "Pacific," and on it he and his men nearly perished from scurvy and starvation. But the resolute Magellan kept his face toward the setting sun and in



From a drawing by R. Caton Woodville

Captain James Cook
Sailing around the island of New Zealand in 1769,
on the *Endeavour*, during the first of three hazardous
voyages across the Pacific Ocean

March found the Ladrones, where he secured fresh food and water. Then he pressed on to the Philippines, where he stayed long enough to become embroiled in local quarrels, and was killed. In the end the survivors of the expedition, led by Juan Sebastian del Cano in the *Vittoria*, made their way around the Cape of Good Hope and back to Europe. In 1577

Francis Drake, bound on a buccaneering expedition to the River Platte, passed through the Straits of Magellan, crossed the Pacific, sailed through the Indian archipelago, rounded that same Cape of Good Hope and returned to England. There Queen Elizabeth boarded his vessel, the *Golden Hind*, and made the bold buccaneer Sir Francis Drake, for he was the first dauntless Briton to carry England's flag around the world. The stupendous exploration of the mercantile seas of the earth was finished. The circumnavigation of the globe was known to all men, and nothing remained to be conquered but the mysteries beyond the icy bastions of the polar oceans.

Martin Frobisher in the years 1576-78 made three voyages into those seas north of us. John Davis, often called the father of polar discovery, made voyages ten years later, and passed Davis Strait into Baffin's Bay. In 1610 Henry Hudson found Hudson Bay, and the commercial development of the northern waters was begun. And still ships and methods of navigation were unworthy of the redoubtable spirits that wrested the secrets from the Seven Seas. The typical seagoing vessel of the time of Charles I was a three-master, like the *Royal Sovereign*, built in 1637. She carried courses, large topsails, topgallants, and royals on her "foer" and "mayne" masts, and, on her mizzen, a latteeen lower sail and a square topsail. Her bowsprit bore two small square sails. She had a low forecastle, cut square across, and a high poop deck. This type of ship held its place till near the end of the seventeenth century. In the first half of the eighteenth century the bowsprit became a real bowsprit and the jib appeared. Before the end of the century ships had topgallant masts, royals, flying jibs, and spankers, long low hulls and no high poops. Such were the

seventy-four-gun vessels with which Nelson drove Napoleon's flag from the seas. In 1818 the first iron ship was built on the Clyde, and the era of the great modern sailing vessels was begun. The Yankee clippers of the fifties were champions of the deep, and the famous *Dreadnaught*, commanded by Sammy Samuels, the great yacht skipper in later days, swept from Sandy Hook to Liverpool in thirteen days, nine hours. But the steamship had appeared, and in 1833 the *Royal William* crossed the North Atlantic from Quebec to London. In 1838 came the first iron steamer, the *Rainbow*, and in 1839 the *Archimedes*, the first propelled by a screw.

Meanwhile

the seaman had ceased to grope his way blindly over the trackless waters. The modern science of navigation had been born, and, though still young, was sufficiently strong to rob the oceans of half the terrors of uncertain position and unexpected landfalls and wrecks on



A Noble Relic of Clipper Days

A veteran of the merchant marine coming through the Golden Gate, San Francisco

rocky shores. Two important inventions revolutionized the art. These were the sextant and the chronometer. They came almost at the same time. John Hadley, an English mathematician, invented the quadrant (the first form of sextant) in 1731, and in 1735 John Harrington, a mechanician, gave the world the chronometer.

Before the invention of the sextant all instruments for measuring the altitudes of celestial bodies at sea either required the use of a plumb line to level them or compelled the observer to try to look two ways at once. The sextant is not dependent on leveling, and it obliges the observer to look only at the horizon. The instrument itself, by reflecting upon the horizon the image of the observed body, automatically registers its angular altitude. The chronometer is simply a clock which will keep almost exact time under all



The Oceanic

First of the "White Star" liners. In 1870 she crossed the Atlantic under steam and sail

the varying conditions of sea travel. The finding of the latitude had never been difficult, since it resolved itself into ascertaining how far a ship was north or south of the sun or how far south of the polar star. But mariners had vainly struggled to get their distance east or west of a given meridian until it became clear that it could best be done by finding the difference in time. Then came the want of the timepiece to carry at sea, for this is the prob-

lem of longitude: with a clock on board keeping the time at a given place (among our seamen it is Greenwich, England) you compute from the altitude of the sun or a star (measured by the sextant) the correct time at your ship, which you cannot keep with a clock because the ship is always moving and changing her time and therefore her longitude. When you find, for example, that your ship is one hour west of Greenwich, you know she is in longitude 15 degrees west. The earth's circumference, like every other circle, is divided into 360 equal parts called degrees, and, since the globe revolves on its axis once in every twenty-four hours, we find that an hour is equal to fifteen degrees.

Peter Barlow devised, in 1820, the modern compass needle and card as they remained till still further improved by Lord Kelvin in 1876. Overcast skies continued to prevent navigators from making astronomical observations, and therefore the "dead reckoning," the actual distance and course of the ship over the water, continued to be measured and will always have to be. After Columbus' "Dutchman's log" came the chip log, a primitive contrivance for measuring the rate of a vessel's speed, and finally in 1802 Edward Massey gave us the rotating



The Majestic on Her Maiden Trip

The *Majestic*, the latest and greatest of ocean liners, is shown here approaching her dock on the Hudson River—with New York's "sky line" as a background. This newest titan of the seas is 56,000 tons register, and nearly a thousand feet long. Fifty years of navigation extend between the *Majestic* and the *Oceanic*, shown above



© Edwin Levick, New York

Ocean-going Yachts

Lined up for a race. These superb sail birds carry their owners anywhere on the Seven Seas

log, which is towed astern of the ship and has its revolutions transmitted to a dial which records the actual number of miles traveled by the ship.

With the application of iron, and afterward steel, to the building of ships' hulls, the mariners acquired another set of difficulties—those created by the influence of the metal on the magnetic needles of their compasses. But science taught them how to correct this error, and now sea captains drive the great ocean liners over the selected lanes almost as accurately as they might have gone on railway tracks.

Captain Thomas H. Sumner, an American ship captain, in 1837, revealed to the world the principles now thoroughly developed in the use of what we call "Sumner lines of position." Then Marq St. Hilaire, a Frenchman, gave us what looks like the last possible improvement on the Sumner method. The earlier process was to find the longitude by observation in the morning and the latitude at noon and, by carrying up the longitude by dead reckoning to noon, thus to locate the ship. This "fix," as seamen call it, placed the ship at the intersection of two lines, a longitude meridian running north and south and a parallel of latitude running east and west. Captain Sumner's method enables the mariner to locate his ship at any hour of the day or night on the intersection of two lines not necessarily running north and south, but none the less fixing the position of the ship. The St. Hilaire method begins by calculating what the altitude of a heavenly body will be

at a given place and time. For example, our ship should be to-morrow morning at 9:30 in latitude $40^{\circ} 30'$ west. The altitude of the sun should then be an amount ascertained by a mathematical formula. At 9:30 we take the altitude of the sun with the sextant. The difference between this "observed" altitude and the calculated one is the amount of error in our supposed position, and the correct position is obtained in a few seconds by applying this difference to the supposed position.

The mariner of to-day has perfectly constructed charts of all the principal waters of the world, good compasses, excellent sextants, and quick and practically accurate methods of ascertaining his position at sea. And he sweeps over the oceans in vessels which are very rarely overcome by stress of weather. The conquest of the seas for all commercial purposes is complete.



© Edwin Levick, New York

A Late-model Racing Yacht "Shaving it Close"

A master hand is needed at the helm as she rounds the stake



A BOLD FUNICULAR RAILWAY CLIMBS TO THE SNOWY ALPS

Lauterbrunnen, 2,615 feet above the level of the sea, is a typical village in the Bernese Oberland, Switzerland, owes much of its fame to its proximity to the Staubbach, one of Europe's most wonderful cascades. Lauterbrunnen is the terminal of one branch of the Bernese Overland Railways (the other branch leads from Interlaken to Grindelwald) and is also the starting point of the Wengernalp Railway, and the bold funicular, shown here climbing up to Mürren



A GLORIOUS SWISS HIGHWAY

The Axenstrasse, $8\frac{1}{4}$ miles long, skirting the southern arm of the Lake of Lucerne, Switzerland, from Brunnen to Fluelen, is one of the most picturesque highways in the land of the Alps. It is mainly hewn in the solid rock, with apertures here and there, where tunnelling became necessary, and thus affords an uninterrupted series of glorious vistas on the classic lake.



AN ELECTRIC RESTAURANT HEWN OUT OF THE MOUNTAIN

Eismeer Station, 10,370 feet above the level of the sea, is one of the wonderful rock stations of the famous Jungfrau Railway, an electric cogwheel line, conveying the visitor in $1\frac{1}{4}$ hours from the delightful pastoral country of the Wengernalp, i.e., from Kleine Scheidegg station, 6,770 feet above sea level, to Jungfraujoch, 11,480 feet above sea level. The station prides itself on a wonderful restaurant for 200 guests, an electric kitchen, and a real post-office.

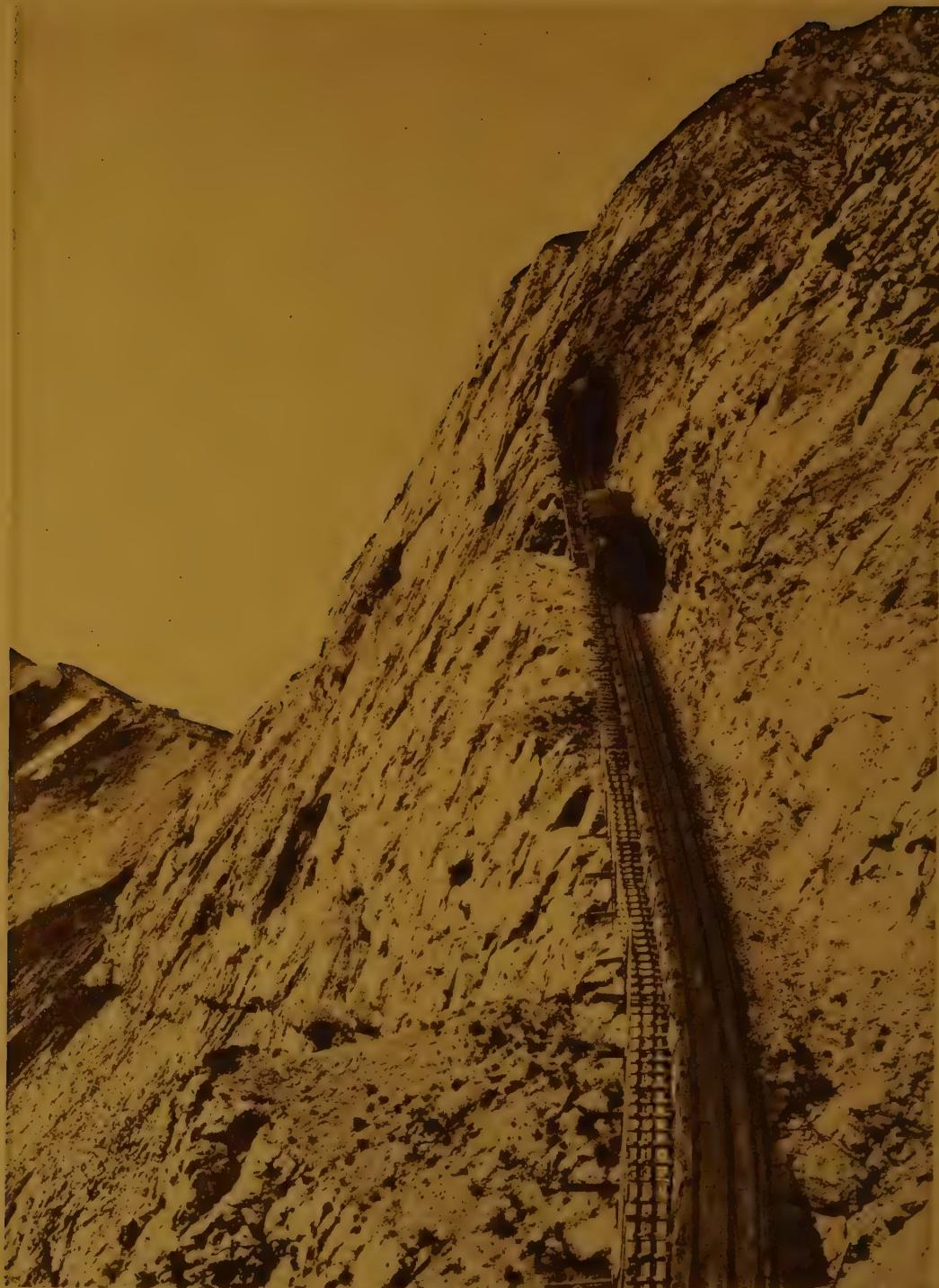
THRILLING THOROUGHFARES

PICTURES SHOWING THE CONQUEST OF NATURE BY THE CONSTRUCTING ENGINEER—TUNNELING THROUGH VAST MOUNTAINS, AND SKIRTING STEEP PRECIPICES; CLIMBING HIGH SUMMITS AND CRAWLING THROUGH NARROW CANYONS; BRIDGING DEEP GORGES AND TURBULENT MOUNTAIN TORRENTS; AND SPANNING BROAD RIVERS, VAST LAKES, AND STRETCHES OF THE SEA. IN GIRDLING THE GLOBE MAN HAS FOUND FEW PROBLEMS THAT COULD NOT BE SOLVED—FEW OBSTACLES THAT COULD NOT BE OVERCOME



THE MAJESTIC MATTERHORN IS PERHAPS THE MOST BEAUTIFUL MOUNTAIN IN THE WORLD

Nut-brown chalets and comfortable hotels nestling together on an expanse of verdant pastures, a mountain silhouetted like a pyramid of marble against the azure sky—so situated is Zermatt, in Switzerland, with its lofty guardian, the Matterhorn. And from this wayside paradise, which is tucked away in a beauteous Alpine vale in the Valais, Switzerland, the sturdy Gornergrat Railroad—a rack and pinion line—climbs in one and one-half hours up to an altitude of 10,289 feet, a realm of glistening glaciers and snow-capped peaks.



A PERILOUS CLIMB UP AND THROUGH THE HEART OF A MOUNTAIN

Alpnachstad, a pleasant village on the Lake of Lucerne, Switzerland, is the starting point of the Pilatus Railway, and the conquest of the precipitous Eselwand, pictured on this photograph, is considered to be the greatest engineering feat on this line. The maximum gradient attained is 48%, and the panorama enjoyed from the summit of the mountain, 6,995 feet above the sea, may indeed be described as "A glimpse into Paradise."



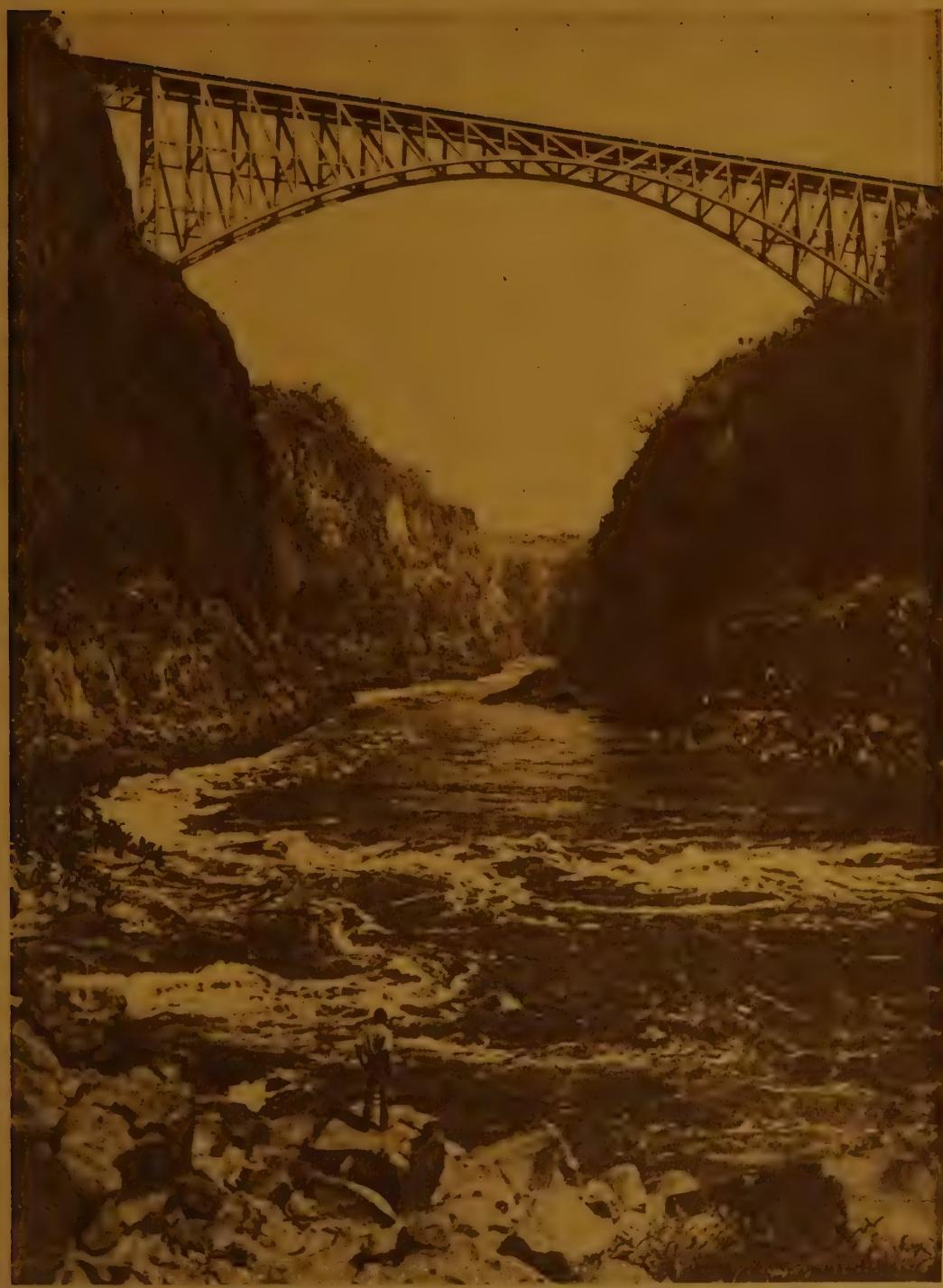
A RAILWAY BRIDGE IN THE WILDEST PART OF CHINA

Here is a viaduct built by French engineers 335 feet above the level of the river and 220 feet in length. Ordinary methods of construction were impossible, so two bascules, as they are called (the triangular sections shown), were erected and gradually lowered until they met, and on them the actual bridge was built. It was a very difficult operation as there was no room to work except from a platform secured to the rock



A VIADUCT SPANNING A RAGING TORRENT

From the heights of the Upper Engadine, the Rhaetian Railway follows the winding course of the River Inn—a tributary to the Danube—down to the famous spa of Schuls-Tarasp-Vulpera, reposing like a jewel in a setting of sunny pastures, forests and mountains. The characteristic Engadine architecture of the natives' homes, which are scattered along the line, add further charm to this picture of scenic splendor.



Keystone View

A SINGLE SPAN ACROSS THE ZAMBESI RIVER, AFRICA

This railway bridge takes a daring leap across the "Boiling Pot" below the Victoria Falls, Rhodesia, Southern Africa. The river, after its tremendous waterfall, rushes down through a tortuous canyon somewhat in the manner of the rapids of Niagara. This great single-span railway bridge crosses the gorge a short distance below the falls, at a height of 420 feet above the

water



A LOFTY VIADUCT IN FRANCE

The Fades Viaduct, across the Sioule River, Puy-de-Dôme, France, is one of the loftiest in the world, the water flowing 434 feet 8½ inches below the rails. It is an impressive monument to the skill of French bridge builders. Eight years were consumed in the construction and it was turned over to the Paris-Orléans Railway in 1909.



THE GIANT BRIDGE OF THE WORLD

The Forth Bridge of Scotland will ever stand as one of the leading engineering achievements of this or any age. The great structure was erected on the "cantilever" or bracket plan. There is a headway for navigation of 150 feet and the total length of the spans and approaches is 8,296 feet. The two great spans are each 1,710 feet in length. Over 50,000 tons of steel were used and the cost of \$15,000,000 would probably be nearly \$50,000,000 today, for the opening took place in 1890.



THE LETHBRIDGE VIADUCT, ALBERTA, CANADA

This viaduct is 5,327 feet long and 314 feet high, and took the place of timber trestles. It is borne upon 33 lattice steel towers, 12,200 tons of steel were used in the construction, and 7,600 gallons of paint were used to protect it.



THE CONQUEST OF DEATH VALLEY

The steel ribbon is now flung across Nevada's sizzling waste of Alkali, where the "20-mule team" formerly held sway, and Death Valley is annihilated by the "T. and T." railroad, which means in plain English "Toponah and Tidewater Railway". Our picture shows an auto with flanged wheels running between Ryan and the borax mines.



CREEPING THROUGH THE ROYAL GORGE

Far down below the point of observation, we can trace the railroad making its way like a slender thread along the boiling river. At the narrowest point of the Royal Gorge, where the train stops for a few minutes, the rocks tower to a height of 2,600 feet, and the railway passes over a bridge hung from girders mortised into the smooth sides of the canyon.



OVER A SWIFT ALPINE STREAM

Many of the most striking beauty spots of Switzerland are today conveniently accessible by the magnificently constructed, new electric Road to St. Moritz, which is a triumph of modern engineering skill. One of the grandest features of the line is the Landwasser Viaduct, near Chur, which spans from Flims to St. Moritz. It is 416 feet long, 113 feet high, and the maximum height of the arches is 80 feet.



CONNAUGHT TUNNEL, CANADA

The longest double-track railway tunnel on the American continent. It pierces Mt. Macdonald, a 9,482-foot peak on the Canadian Pacific Railway, 85 miles west of Field, B. C. This tunnel is five miles long and cost twelve million dollars to build. In the course of its construction it was necessary to move the bed of the Illecillewaet River. It brings the summit elevation of the Selkirk portion of the line from 4,330 feet down to 3,791 feet and reduced the length of maximum grade from 22.15 miles to 6.61 miles, leaving the maximum grade 2.2 per cent.



THE "HAVANA SPECIAL" ON LONG KEY VIADUCT

The Florida Keys have been annihilated by the great engineering work of the late Henry M. Flagler which was under construction from 1905 to 1912. It is sometimes called the "million dollar a mile road." One of the viaducts is seven miles long. This railroad to America's Gibraltar succeeds in solving the problem of a trip to Havana without a long sea voyage.



THE FAMOUS HORSESHOE CURVE

This is one of the oldest railway wonders, and is located just west of Altoona, Pa., in the heart of the Allegheny Mountains. It is what is commonly known as a 9-degree curve and extends over a distance embracing over 180 degrees. The grade west-bound is 1.75 feet to 100 feet. The crest of the curve from Altoona west is at Gallitzin, from which point there is a distinct grade of practically one per cent to Cresson.



BRIDGING NIAGARA'S GORGE

A thoroughfare familiar to most American travelers, and so well known to young couples visiting Niagara that it might properly be called the "Bridal Bridge." It is a new bridge, built for trolleys, vehicular traffic, and pedestrians. It is largely patronized, for it affords a vantage ground from which to view the seething rapids. A glance from the center of the bridge straight down to the boiling water gives the observer one of the biggest thrills that Niagara affords.



Courtesy Southern Pacific Railroad

BRIDGING GREAT SALT LAKE

A great achievement was scored in making a "cut-off" across Great Salt Lake in Utah. The lake was not too deep so the engineers built a level line across the lake, on trestles which were filled in with earth for part of the way, but there is twelve miles of timber trestle; 147½ miles of the old steep road was abandoned when this \$5,000,000 improvement was completed.



Underwood & Underwood

THE LAST LINK IN "THE IRON TRAIL"

If you have read Rex Beach's "The Iron Trail," the tale of the building of the great railroad up the Copper River in Alaska, you will remember how Murray O'Neil—the hero—rushed to stand or fall with his bridge. This is the bridge. Each year the ice from the great Chilis and Miles Glaciers piles up in huge chunks, weighing many tons, against the heavy steel "breakers"—shown at the right in the river—but the breakers do their work and the structure stands, a monument to American engineering skill.



© U. & U.

BRIDGE OVER THE GREAT GORGE AT LAUNCESTON, TASMANIA

The beautiful island of Tasmania, off the southeastern coast of Australia, is riven by hundreds of picturesque valleys, whose high steep sides confine riotous streams tumbling over rocky beds to the ocean. Visitors to the famous gorge near Launceston pass over this footbridge at one of the widest reaches of the chasm.

BONDS BENEATH THE SEA: THE CABLES



Courtesy U. S. National Museum

The Great Eastern Laying the Transatlantic Cable

Painting by Robert Dudley

IT IS difficult to realize to-day, when sailors in mid-ocean are linked by radio to their own firesides, that the first transatlantic cable was laid within the memory of many people now living. Before this event, news from Europe was nearly two weeks old when it arrived. The last land battle in the American War of 1812 was fought fifteen days after a treaty of peace with Great Britain had been signed!

The first transatlantic cable was laid in 1858, but the project was launched some years earlier. In 1842 Professor Samuel Morse laid a telegraph line on the bottom of the New York Harbor between the Battery and Governor's Island; and, though this line was carried away by a dragging anchor shortly afterward, the result of the experiment convinced the inventor that a transatlantic electric telegraph was feasible. In 1845 efforts were made in England to form a cable-laying company. No progress was made, however, until in 1847 Werner von Siemens, a German, devised a method of coating wire with gutta-percha. Gutta-percha is a vegetable gum which resembles rubber, but which, unlike rubber, is not elastic. It is an almost perfect non-conductor

of electricity, and does not deteriorate in sea water.

The first permanent submarine cable was laid under the English Channel, between Dover and Calais, in 1851. The public thought it a gigantic swindle. It was believed that signaling consisted of pulling a wire after the manner of the old-fashioned house bell! But within the next few years several cables were laid, and they ceased to be a novelty.

In the summer of 1853, Lieutenant O. H. Berryman of the United States Navy carried a line of deep-sea soundings across the Atlantic from Newfoundland to Ireland. He found the ocean floor to be comparatively level, and free from strong currents. The average depth of the water was about two miles. This gave impetus to the idea of a transatlantic cable. The first step in the actual building of the cable was taken by an English engineer, F. M. Gisborne. He proposed to run fast steamers between St. John's, Newfoundland, and Ireland, to connect with a telegraph line across Newfoundland to Cape Ray. The messages were then to be relayed between Cape Ray and the American mainland by carrier pigeons. This

would have shortened the communication between America and Europe to from five to six days.

While in New York attempting to raise money, Gisborne met Cyrus W. Field, a prominent American merchant. Although comparatively a young man, Field had retired from business; but when he heard of Gisborne's plan he was fired with the more ambitious project of building a submarine telegraph line across the Atlantic. With a few other wealthy New Yorkers, he organized the New York, Newfoundland and London Telegraph Co., of which Gisborne was chief engineer. By 1856 the company had not only spanned Newfoundland with a telegraph line, but had also laid a cable to the mainland.

In 1856, Field visited England, and there organized the Atlantic Telegraph Cable, for the definite purpose of laying a transatlantic cable. John W. Brett and Charles T. Bright were his partners. The British public quickly supplied the necessary capital: among the subscribers were W. M. Thackeray and Lady Byron.

Field's next twelve years were filled with hardship and repeated failure. Sixty-four times he crossed the ocean, suffering seasickness each time! He succeeded in winning the coöperation of the British and American governments. The U. S. S. *Niagara*, the largest steam frigate in the world, the *Agamemnon*, one of the finest British battle-

ships, and a number of other naval vessels were assigned to the work. Valentia, on the west coast of Ireland, and Trinity Bay, Newfoundland, were chosen as the landing points for the cable, the distance being 1,640 nautical miles. Two thousand five hundred miles of cable was manufactured in England, and stowed on board the two warships. The Irish end was landed August 5, 1857, and the *Niagara* started westward with the cable. Several nights later, when the cable was running out too fast, the brakes of the paying-out gear were applied too firmly, and the cable parted, 335 miles from shore. No more could be done that year.

Undaunted, Field and his associates made elaborate preparations for the second attempt. This time the two halves of the cable were spliced in mid-ocean. Afterward, the *Niagara* steamed toward Newfoundland, while the *Agamemnon* pointed her bow toward Ireland. Twice the cable broke, and twice it was respliced. It broke a third time, when the ships were 300 miles apart, and the party returned to Ireland.

A month later a third attempt was made, which ended August 5, 1858, when the two ends of the cable were safely landed on opposite sides of the ocean.

Field telegraphed the joyful news to the press. "And never did the tidings of any great achievement—whether in war or peace—more truly electrify a nation," he writes



Courtesy U. S. National Museum

Landing the Shore End of the Cable at Valentia, Ireland

Painting by Robert Dudley



Courtesy U. S. National Museum

Painting by Robert Dudley

"The Cable Works!" A Climax in the Great Undertaking

Scene in the test room of the *Great Eastern* September 1, 1866, when signals were received from Ireland over the cable of 1865, which had just been recovered after lying on the bottom of the ocean for thirteen months

in his "Story of the Atlantic Telegraph." Celebrations were held in England and America. The first regular messages were exchanged on August 16th, between President Buchanan and Queen Victoria. This was the signal for a second outburst. The rejoicing was cut short suddenly by the news that the cable had ceased to work! Its total life was barely four weeks, and it had carried only 400 messages. A current too strong for the cable had been used, and the insulation was ruined. The line had lived long enough, however, to demonstrate its immense value. A single message, countering orders for the sailing of two British regiments from Canada to England, saved the British Government a quarter of a million dollars.

For the next seven years no further attempt was made to lay a cable across the Atlantic, but several long submarine lines were laid in other parts of the world, and much valuable experience gained. Then, in 1865, Field made another effort, again financed by British capitalists. This time the cable was nearly twice as heavy as before, and the whole of it, weighing nearly 4,000 tons, was taken aboard a single vessel, the celebrated *Great Eastern*, the largest vessel in the world.

The *Great Eastern* left Valentia, July 23,

1865. One thousand miles out, the cable parted, and its end was lost in a depth of about two miles.

Success came at last in 1866. The *Great Eastern* set forth again with a new cable, and successfully completed her work on July 25, 1866. Soon afterward the end of the broken cable of 1865 was located in mid-ocean, and the *Great Eastern*, with the aid of two other vessels, fished it up. On September 9, 1866, two cables were in operation between America and Europe. To-day there are seventeen cables across the North Atlantic; altogether, throughout the oceans of the world, there are 250,000 miles of cable.

Very feeble currents are used in cabling as compared to those used in land telegraphy. Signals have been sent across the ocean and back with the current generated in a woman's thimble!

A modern submarine cable consists of a central conductor of copper wire surrounded by a thick layer of gutta-percha, around which is a sheathing of iron and steel wire, which, in turn, is enclosed in a jute wrapping. A layer of brass tape is often placed just outside of the gutta-percha to prevent teredos, or ship worms, from boring into the cable. The steel wire protects the cable from mechanical injury.



THE MENTOR QUESTIONNAIRE

EDITORIAL NOTE—So many of the answers in our Questionnaire Competition were correct in the essential facts that the selection of prize winners was a very difficult and delicate matter. Each of the answers printed below is a *composite answer*, made up by combining the best matter found in the answers of several competitors whose work was of equal merit.

Question 1. Who was the original Robinson Crusoe, and what was his story?

Answer. Though Defoe is said to have denied it, the original of Robinson Crusoe is claimed to be Alexander Selkirk (1676-1721), seventh son of John Selcraig of Largo, Fifeshire, Scotland. He was an unruly individual, who was called before the church session of his town for indecent behavior in meeting, and, to escape punishment, he ran off to sea. In 1709 he was sailing master of a "Cinque Ports" galley in a privateering expedition to the South Seas. In September, 1704, he had a quarrel with his captain, Thomas Stradling, and was put ashore, at his own request, on the uninhabited island of Juan Fernandez, situated about 360 miles west of Chile, and about 38 square miles in area. He lived there four years and four months, and was then rescued by Captain Woodes Rogers, Commander of H. M. S. *Drake*. His story was recorded by Captain Rogers in his "Cruising Voyage Around the World" (1712). Afterward, Selkirk attained the rank of lieutenant in the navy, and died on board the *Weymouth*. A tablet to his memory has been erected by British seamen at "Selkirk's Lookout" on the island where he stood when he sighted his rescuer. Selkirk's adventures were embodied in several narratives of voyages, and in a sketch by Richard Steele. Cowper imagined his solitary musings in the poem beginning "I am monarch of all I survey."

Prize Winners: Harriet M. Meighen, Perth, Ontario, Can.
Edward F. O'Day, San Francisco, Cal.
Francis Waring Robinson, Lakeville, Conn.
Isabel Hopkins, Atlantic City, N. J.

Question 2. What were the Four Horsemen of the Apocalypse, and what did they stand for?

Answer. The word "Apocalypse" means the "Revelation," made to the Apostle John, in the Isle of Patmos, as recorded in the biblical Book of Revelations. The Four Horsemen are described in Chapter VI of that book. In the Apocalypse, as a literary form of ancient literature, we find the symbols used are often animals of various kinds—in this case, horses. According to Saint John, the Lamb, having seven horns and seven eyes, "which are the seven spirits of God," opened the book sealed with seven seals, which was in the right hand of "Him that sat on the throne." Four seals were opened and each time a curse came forth. First came Conquest—or Plague—on a white horse, with a bow and crown. Second came War on a red horse. Third was Pestilence on a black horse, with balances in his hands, spreading famine over the earth. The last seal revealed Death, on a pale horse, with Hell following him. They symbolize martial ambition, lust of conquest, spoliation, and death, therefore allegorically associated with the glamour, the horror, and the devastation of war. Blasco Ibáñez has used this symbolism in his book "The Four Horsemen of the Apocalypse."

Prize Winners: Alice O. Secord, New York City.
Mrs. John G. Holton, Milledgeville, Ga.
Edward A. L. Griffin, Buffalo Gap, S. D.

Question 3. Who was the Wandering Jew? In what books does he appear?

Answer. The legend of the Jew who cannot die, but, as a punishment for his offense against Jesus Christ, is obliged to wander ever over the earth, seems to have originated in a suggestion of an undying one in the words of Christ concerning the Apostle John, "If I will that he tarry till I come, what is that to thee?" In legendary story a Jew offered an insult to Christ bearing his cross on the way to Calvary, and was condemned to wander the earth without resting, renewing his youth when he became old. One legend makes him the doorkeeper of Pontius Pilate's judgment hall; another makes him a carpenter; still another a cobbler. In Greek tradition we get Aristaeus, a poet who appeared and disappeared alternately for over four hundred years. In Jewish story, we get Cartaphilus, or Kartaphilos, porter for Pontius Pilate, also Ahasuerus the cobbler. In Germany we get John Buttadous; in France, Isaac Laquedem; in Venice, Salathiel. The Wandering Jew appears in many books, chiefly: "The Wandering Jew," by Eugene Sue; "Salathiel," by Croly; "Curse of Kehama," by Southey; "The Wandering One," by Mrs. Norton; "Isaac Laquedem," by Dumas; "Wandering Jew," by Galt; "Prince of India," by Lew Wallace, and many others in many languages.

Prize Winners: Mrs. Harry E. Knappenberger, Mertztown, Pa.
Gladys F. Pratt, Newark, Del.
Dorothy Willinger, Penn Yan, N. Y.

Question 4. What was the Magic Skin, and what was its power?

Answer. Honoré de Balzac wrote a tale in 1831 called "Peau de Chagrin" ("Wild Ass's Skin"), in which he incorporated portions of his own philosophy. The central idea is the conflict between the ideal and the material. The Magic Skin is the skin of a wild ass, engraved with Sanskrit characters, and bearing the seal of Solomon. It gives the power of gratifying every material wish. Raphael de Valentin, the hero of the story, who has rejected the simple joys and stern realities of human existence and wants more than life can give, secures the skin. It fulfills his wishes but uses up his vital powers—the condition of the fulfillment of every wish being that the skin shrinks and the possessor's life shortens. By virtue of this talisman, Raphael becomes rich and famous and beloved of Pauline. The skin, however, exacts its penalty, and with the fulfillment of each wish becomes smaller. Distracted, he tries mechanical force, chemistry, everything, to stretch the skin, but in vain. He tries to refrain from wishing, but is overcome by the material side of his nature. He uses up his vital powers and dies because the skin has been wished entirely away.

Prize Winners: Sister M. Loyola, St. Joseph Convent, Pittsburgh, Pa.
Anna K. Bennett, Watsonville, Cal.
Joseph E. Vincent, Jr., Jersey City, N. J.

Question 5. Who were the Lilliputians?

Answer. The Lilliputians were an imaginary people, inhabiting an imaginary South Sea island, on which an equally imaginary Lemuel Gulliver was shipwrecked. Dean Jonathan Swift, the author of this wonderful tale, uses these little people to satirize the society of his time. The name is composed of "put," a slang expression of the day for an odd fellow, and "lilli," common baby talk for "little." These pygmies were about six inches tall, good-looking, shrill-voiced, and kindly intentioned. They were excellent mathematicians, and well versed in mechanics. Their sovereign, who ruled over twelve miles square, was taller by the breadth of Gulliver's nail than his fellows, and was therefore a mighty man. Gulliver held their ruler in the palm of his hand and put the officers in his pockets. Ten thousand of them could stand on Gulliver's body at one time. They called him the "Man Mountain." While the story is a trenchant satire, most readers enjoy it simply as an absorbing tale of adventure.

Prize Winners: Kathleen MacNeal Durham, Bay City, Ore.
Martha A. Perry, Scranton, Pa.
Gerald Mahon, Superior, Wis.
Carrie A. Staley, Washington, D. C.

Special Mention: Dorothy L. Black, Brookline, Pa.

Question 6. What was the real name of the author of "Alice in Wonderland," and what was his profession?

Answer. His real name was Charles Lutwidge Dodgson. His pen name was derived from Lutwidge, being close to Ludwig, the German form of Lewis, and Carroll, coming from Carolus, the Latin form of Charles. He was born in Daresbury, Cheshire, England, in 1832, and attended Rugby and Christ Church, Oxford. Winning a prize in mathematics, he was appointed mathematical lecturer at Oxford, and held that chair for twenty-seven years. In 1861 he took orders in the Church of England, but a difficulty in speech prevented his preaching. He published several works on mathematics, but is known to the world at large by his delightful stories and verses for children, "Alice in Wonderland" and "Through the Looking Glass," "The Hunting of the Snark," and "Sylvie and Bruno." Three little girls, Alice, Lorena, and Edith, daughters of a neighbor, Dean Liddell, led Dodgson from mathematical problems out into the rich imagery of Wonderland. Although the authorship of the Alice books was well known, he persistently refused to be identified with Lewis Carroll. When he died in 1898, this tribute came from two women whose childhood he had charmed: "To the memory of the sweetest soul that ever looked with human eyes."

Prize Winners: Frank E. Gates, Whittier, Cal.
Olive T. Kephart, Washington, D. C.
William H. Peet, Topeka, Kan.

PRIZE-WINNING ANSWERS



Question 7. What great dramatic incident in romantic fiction is associated with the prison *Château d'If*, in the Mediterranean?

Answer. The Château d'If is the scene of the dramatic escape of Edmond Dantès, hero of Alexandre Dumas' novel, "The Count of Monte Cristo." The Château d'If is a castle on the small Mediterranean island of If, two miles west of Marseilles, built in 1529, and used as a state prison. Edmond Dantès was unjustly imprisoned there. In a nearby cell was confined Abbé Faria, an old priest. They contrived, unknown to their jailers, to bore a secret passage between their dungeon cells so that they were able to spend hours together, and the abbé became Dantès' friend and teacher. The abbé imparted to Dantès the discovery of an old document telling where, on the Island of Monte Cristo, the Cardinal Spada had concealed an immense treasure. When the old abbé died, Dantès took the place of the body, sewing himself into the burial sack. Thrown by the jailers into the sea, "the cemetery of the Château d'If," Dantès cut open the sack and made his escape. He then found the treasure, reappeared in the world as the "Count of Monte Cristo," and, under that and other titles, revenged himself on those responsible for his false imprisonment.

Prize Winners: Cora G. Smith, Corry, Pa.
Clara Rosengarten, Albany, N. Y.
F. O. Hathaway, Stockton, N. J.
Mrs. Henry M. Smith, Escondido, Cal.

Question 8. Who was the "Black Knight" in Walter Scott's novels, and what part did he play in history?

Answer. The Black Knight was Richard Cœur de Lion, meaning "lion-hearted," king of England from 1189 to 1199. He was the third son of Henry II and second Plantagenet king of England. He appears in Scott's novels: "The Betrothed," "The Talisman," and "Ivanhoe." In the first he accompanies his father in the siege of the Castle of Garde Doulouse; in the second, as chief of the princes arrayed against Saladin in the Third Crusade, he caused the abandonment of the enterprise by his arrogant, reckless, and impudent manner; in the third he aids Ivanhoe at a critical moment in the tournament of Ashby, when he was styled among the fighting knights as Le Noir Fainéant, "The Black Sluggard." His chief part in history was in the Third Crusade, conquering Cyprus, capturing Acre, taking Jaffa from Saladin, suppressing his brother John at home, and defeating his brother's ally, Philip II. He was mortally wounded at the siege of Chaluz near Limoges. He had "all the virtues and vices of a savage." He was brave, ruthless to his enemies, and idolized by the English.

Prize Winners: A. Francis Trams, Joliet, Ill.
A. C. Stuart, Chicago, Ill.
Irene George Mentor, Tenn.
Christine Gronke, Brentwood, Md.

Question 9. Who was Sydney Carton, and what was the supreme act of his life?

Answer. Sydney Carton! The real hero of Dickens' "Tale of Two Cities." Lacking the self-assertion, the ambition, and steady application necessary to success, a drunkard and a wastrel, but, in his heart, the supreme love—for "greater love hath no man than this, that he lay down his life for his fellow man." He loved Lucy Manette, the wife of his friend Darnay, who had been imprisoned and condemned to death. Carton, who resembles Darnay closely, drugs Darnay to make him insensible, so that he is removed in Carton's clothes and escapes. On the way to the guillotine, Carton comforts a little seamstress, also innocent, who has known his friend Darnay in prison. "Are you dying for him?" she whispered. "And his wife and child. Hush! Yes." "O, you will let me hold your brave hand, stranger?" "Hush! Yes, my poor sister; to the last." He was executed through noble self-sacrifice for the happiness of the woman he loved. And at the guillotine his face was "the peacefullest man's face ever beheld there." So Sydney Carton joined the Immortals.

Prize Winners: J. H. Butcher, Buffalo, N. Y.
Dorothy Stimson, Northampton, Mass.
Esther Ropes, Salem, Mass.

Question 10. Who was "The Man Without a Country," and what was his story?

Answer. "The Man Without a Country" was Philip Nolan in Edward Everett Hale's story of the same name, written during the Civil War. He was a fictitious character of a story written to arouse a moral principle in young Americans. Nolan in Hale's story was a young officer of the United States Army at the time

of Aaron Burr's Southern expedition. Fascinated by Burr, he was led to treason. Court martial followed. When questioned, Nolan exclaimed in frenzy, "Damn the United States! I wish that I may never hear of the United States again!" The court sentenced him to have his wish fulfilled. He was put on board a government vessel. The mention of the United States was never permitted in his presence. From 1807 to 1863, transferred from ship to ship, he was kept out of sight and out of hearing of his country. No book or newspaper telling of the United States was given to him; the name of his country was torn out of everything he read. That was all his punishment, and in it he found disgrace and torture. On his deathbed, he begged to hear of his country and of her history during his exile at sea. In his Bible, after his death, were found these words: "Bury me in the sea; it has been my home. But will not someone set up a stone for my memory at Fort Adams or at Orleans, that my disgrace may not be more than I ought to bear? Say on it: 'In Memory of Philip Nolan, lieutenant in the Army of the United States. He loved his country as no other man has loved her, but no man deserved less of her hands.'"

Prize Winners: Mrs. Edward Sears, Deer Lodge, Mont.
Millie Bock, West DePere, Wis.
Gertrude L. Wright, Grand Junction, Colo.

Question 11. Who was the Giant Despair?

Answer. Giant Despair was an allegorical character in Bunyan's "The Pilgrim's Progress," representing the doubt, distrust, and despair that darken the path of the pilgrim on his heavenward way. Giant Despair lived in Doubting Castle with his wife Diffidence, who was a distrusting, despairing mate. They were giants because the things they stood for are usually big stumbling blocks in life's progress. Finding the pilgrim Christian and his companion Hopeful asleep on his grounds, he accused them of trespassing and cast them into a filthy, dark dungeon where they remained without bread or drink from Wednesday to Saturday. On the advice of his wife, Giant Despair beat and otherwise abused the pilgrims, in an attempt to dishearten them and make them take their own lives. They were desperate, until Christian remembered the key "Promise," which he had in his bosom, and which opened all doors in the dungeons of Doubting Castle and let them out into the light of hope. This sunny light was too much for Giant Despair, who fell in a fit, and the two pilgrims made their escape, erecting a sign there to warn others that might come that way.

Prize Winners: Florence Parker, Dubuque, Ia.
Elizabeth Siddall, South Pasadena, Cal.
Florence E. Spencer, London, Ontario, Can.
Thomas Davenport (age 12 years), Mer Rouge, La.

Special Mention: Grace Darrach, Philadelphia, Pa., whose answer was written in excellent verse.

Question 12. Who were the following characters, and in what books do they figure?

Answer. Nydia: Blind flower girl—"Last Days of Pompeii," Bulwer Lytton.
Natty Bumppo: Guide and Indian fighter—"Leather-Stocking Tales," J. Fenimore Cooper.
Messala: Treacherous young Roman—"Ben Hur," Lew Wallace.
Cosette: Jean Valjean's adopted waif—"Les Misérables," Victor Hugo.
Flora MacIvor: Heroine—"Waverley," Walter Scott.
Mulvaney: One of the "Three"—"Soldiers Three," Rudyard Kipling.
Beatrix Castlewood: Beautiful cruel heroine—"Henry Esmond," W. M. Thackeray.
Dandy Dinnmont: Humorous farmer character—"Guy Mannering," Walter Scott.
Tito Melema: False husband of heroine—"Romola," George Eliot.
John Silver: Piratical sea cook—"Treasure Island," Robert Louis Stevenson.
Alessandro: Indian husband of heroine—"Ramona," Helen Hunt Jackson.
Gavin Dishart: Title character—"Little Minister," J. M. Barrie.
Miss Meadows: In connection with "de gals"—"Uncle Remus," Joel Chandler Harris.
Rab: Noble mastiff—"Rab and His Friends," Dr. John Brown.
Red Wull: Villain dog character—"Bob, Son of Battle," Ollivant.
Buck: Dog hero—"The Call of the Wild," Jack London.

Prize Winners: M. Aimée Ballard, Portland, Me.
M. Markley, Washington, D. C.

Special Mention: Anna C. Root, Great Falls, Mont.
Carrie O'Neal, Bellevue, Ky.
Pauline Hill, Raleigh, N. C.

SAILING THE WORLD ALONE

ASAILING feat never equaled in the history of navigation was accomplished by Captain Joshua Slocum when, a quarter of a century ago, single-handed, he sailed around the world in his little yacht, *Spray*. The *Spray* was only thirty-six feet long, and her gross tonnage was 12.71. When Captain Slocum, an old-time clipper commander, came into possession of her in 1892, the craft had lain for years in a pasture at Fairhaven, opposite New Bedford, Massachusetts. Captain Slocum remade the vessel—bent her breasthooks, set her masts, and calked her expertly there in the meadow, often advised by veteran whaling captains from New Bedford.

After a year's labor, Captain Slocum determined to make a voyage around the world in the rebuilt *Spray*. Other mariners had girdled the globe in small vessels, but no one had ever attempted the voyage alone, "with not even a dog for companion." Captain Slocum came of blue-nose Nova Scotia stock, and had sea-faring ancestors on both sides of his family. When a lad he went to sea as cook on a fishing boat, and finally got to be captain of trading vessels that sailed the Seven Seas.

But, experienced navigator that he was, when he said good-by and headed for the open sea, few thought they should see him again. To sail around the world in a tiny sailboat, with only two hands to steer, handle the ropes, cook, and keep things shipshape—that was something no man had ever accomplished successfully.

It was known among mariners that he was attempting the trip, and he was frequently recognized on the sea highway, and at ports along his route. His only chronometer was a "tin clock" bought at Yarmouth for a dollar. Sometimes the captain of a big liner would call down the reckoning of longitude from his bridge aloft, and Slocum would remark

with satisfaction the perfect agreement of his clock with their costly instruments. At Gibraltar, and other important stops on the way, the old skipper experienced warm hospitality and attention from officials and magnates.

Many thrilling things happened on the voyage. Once the *Spray* barely escaped shipwreck on the sands of Uruguay. Another time it was submerged by a great wave off Cape Horn, where it weathered the worst storm Captain Slocum had ever experienced, and came off "whole-some and noble." After that there was no doubt as to her seaworthiness.

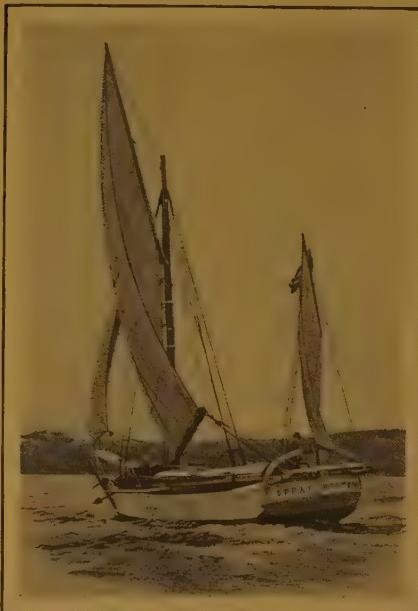
Savages threatened from their canoes, but, aside from his gun, Captain Slocum had a sure defense against invaders. At night, before he went to bed, he used to sprinkle carpet tacks on the deck,

and then sleep, serene in mind, knowing that bare-footed marauders would not go many steps across those tacks.

Once the lone captain sailed for seventy-two days without sighting a port. Whales, and birds, and flying fish were the only living things he saw. He sailed among the islands of the South Pacific to Australia, breasted the perils of a coral sea, called at the remote Island of Mauritius, rounded the Cape of Good Hope, touched Napoleon's Island of St. Helena, and at last, from a Brazilian port, cleared for home, June 5, 1898, after three years in foreign seas. A month later, tired of "baffling squalls and fretful cobble-seas," he tied up at Fairhaven, Massachusetts, birthplace of the *Spray*, after a cruise of over 46,000 miles.

For ten years Captain Slocum stayed contentedly on land. Then the sea-hunger took him again, and once more he set out in the *Spray*. But this time he did not come back. No one ever saw him again; from the broad ocean that was his grave there came no word of him.

Ruth Kedzie Wood.



Courtesy Century Co.

Captain Slocum's Yacht *Spray*



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It's just AS I said	or	It's just LIKE I said
How MANY are there	or	How MUCH are there
I WOULD like to go	or	I SHOULD like to go
The FIRST TWO lessons	or	The TWO FIRST lessons
He sat AMONG the three	or	He sat BETWEEN the three
The wind blows COLD	or	The wind blows COLDLY
You will FIND ONLY one	or	You will ONLY FIND one

2. How Do You Say—

evening	EV-en-ing	or	EVE-ning
ascerTain	AS-ter-tain	or	AS-CER-tain
hosPitable	HOS-pi-ta-ble	or	hos-PIT-a-ble
abdomen	AB-do-men	or	ab-DO-men
mayorality	MAY-or-al-ty	or	may-OR-al-ty
amenable	a-ME-na-ble	or	a-MEN-able
acclimate	AC-climate	or	ac-CLI-mate
profound	PRO-found	or	pro-FOUND
beneficiary	ben-e-fi-SH-E-ary	or	ben-e-FISH-ary
culinary	CUL-i-na-ry	or	CU-ll-na-ry

3. Do You Spell It—

superCede	or	superSede	repEdition	or	repIitition
recElve	or	recIEve	sepArate	or	sepErate
reprElve	or	reprIEve	aCoModate	or	aCoMModate
donKEYS	or	donKIES	traffICKing	or	traffICKing
factoRIES	or	factorYS	aCSeSible	or	aCCeSSible

Answers

1
Between you and me
I wish it would come
Whom shall I call
It's just as I said
How many are there
I should like to go
The first two lessons
He sat among the three
The wind blows cold
You will find only one

2

EVE-ning
AS-ter-tain
HOS-PIT-a-ble
ab-DO-men
MAY-OR-al-ty
a-ME-na-ble
ac-CLI-mate
pro-FOUND
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The Open Letter

THE final results of the Prize Questionnaire are printed in this number of The Mentor. It has taken several weeks of close, careful examination to sift down the answers.

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And the impressive fact that came home to us when we began to examine the papers was that about 80 per cent of the answers were, in the main essentials, correct! That is a pretty sound assurance of the intelligence and book knowledge of The Mentor readers. Accept our compliments.

On our side, however,—the editorial—the results aroused a good deal of concern, for it meant a very close decision on every question.



In some cases answers were so evenly balanced in correctness of statement that we had to decide finally according to the qualities of style—and not infrequently the decision rested on the mere matter of spelling, or, in case of foreign words, the accent. Many answers, quite correct, were rejected because they were literal copies of statements found in the Century Dictionary of Names, or some other well-known and easily accessible reference work. Such sentences, appearing in exactly the same words in the answers of a number of competitors, put those answers out of the running. Preference was given to competitors who showed the greatest industry in research and the most original powers of expression.

There were cases in which there seemed to be no way to make a fair distinction between the merits of several competitors. In such

cases we have given a prize to each of these competitors. As a result there are forty prize winners instead of twelve, as originally provided for. And close to the prize winners came a host of competitors entitled, in the fullest sense, to "honorable mention." Had we printed all their names, it would have filled pages of The Mentor.

Aside from all the other competitors, and altogether unique in his contribution, stands Mr. Harry H. Graham of Wilkinsburg, Pa. Instead of sending in his answers in the usual form, he gives us a little one-act scene entitled, "The Court of Ulysses," in which our questionnaire is answered in the course of a dialogue between Mentor, the wise tutor of classic Greece, and his pupil, Telemachus, the son of Ulysses. Mr. Graham's presentation is clever and ingenious, and deserves special mention.



The satisfactory part of this questionnaire has been the assurance received from competitors that they had a fine, profitable time working out the answers. Many have accompanied their answers with enthusiastic letters, telling us of "the fun they got out of looking up things that they ought to know, and, in many cases, used to know, in the wonderful world of books," and the pleasure they got in "freshening up their minds about the good old books and characters."

In nearly every letter we find a request for another prize questionnaire. When we prepared this book questionnaire, it was our intention to follow it up with several others. There was to be an "American History Questionnaire," an "Art Questionnaire," and several others. We shall prepare these questionnaires very soon—that is, if my health holds out. I personally examined *every one* of the thousand papers in the present competition—and I have not yet fully recovered.

W. D. Moffat
EDITOR.



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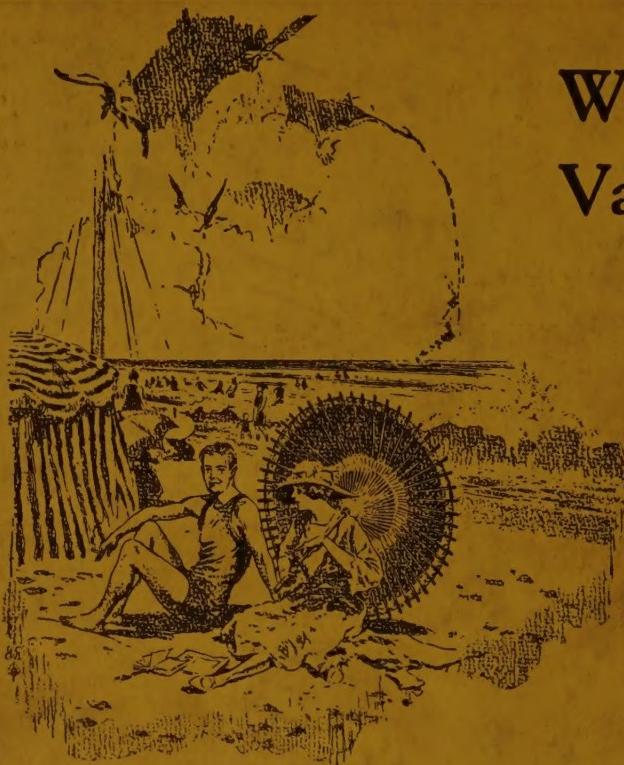
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